

A 5-year audit of outcome of apicectomies carried out in a district general hospital

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Success rates of up to 90% have been claimed for apicectomy. However, the conditions that this procedure is carried out under at district general hospitals may be at variance with such studies. A 5-year audit of outcome was therefore carried out within a district general hospital. It was found that 89% of apicected teeth still remained at 5 years. Outcome was not influenced by any of the factors examined, and could not be predicted radiographically. Most failures occurred after the average postoperative review period of 10.5 months. Patient satisfaction with the procedure was high at over 90%. Based on these results it was concluded that apicectomy was an effective procedure when carried out by staff of all grades within the district general hospital, and that repeated follow-up appointments with radiographs over the first postoperative year were not useful.

Apicectomy is a common surgical procedure that is carried out to eradicate periapical sepsis and/or odontogenic cysts, with the aim of avoiding extraction of the involved tooth. Most, but not all, patients are referred to oral and maxillofacial departments for apicectomy, after the failure of orthograde endodontics. Such referrals may constitute up to 15% of the workload of an oral and maxillofacial unit in a district general hospital.

Success rates for apicectomy between 70% and 90% are cited (1), depending on such factors as the tooth involved and the number of previous attempts. However, these figures may not be applicable to procedures carried out in a district general hospital. Although most patients will

usually be assessed by a consultant or senior member of staff, the procedure will be carried out by surgeons of varying experience under differing conditions. Moreover, the follow-up time for many previous studies has been 2 years or less (2). Whether carried out under local or general anaesthesia, apicectomy may represent a considerable ordeal for the patient, and this seems to have received little attention in previous studies or audits.

It was therefore decided to conduct a 5-year audit of outcome of apicectomies carried out in the Oral and Maxillofacial Surgery Department at Poole Hospital, to determine what preoperative, operative, and postoperative factors, if any, influenced outcome. Furthermore, as the postoperative review of apicectomy cases often involves repeated follow-up appointments with radiographs, at considerable time and expense, it seemed pertinent to examine the value of this process. It was also thought necessary to obtain the patients' views on the treatment that they had received.

As this was an audit, a standard of outcome was identified. Based on the results of previous studies, it was deemed that an acceptable outcome was an 80% success rate; success being defined as the apicected tooth remaining and being asymptomatic without further endodontic treatment at 5 years.

Methods

In all, 200 patient names and numbers were identified from clinic daybooks and theatre lists, of all the patients who had undergone apicectomies under general or local anaesthesia during 1988 and 1989. Of this number, only 147 of the clinical records were obtainable. Various mucogingival flap designs were used and in all cases

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Table 1. Radiographic assessment and grading

<i>Grade</i>	<i>Expected outcome</i>	<i>Retrograde root filling</i>	<i>Root length</i>	<i>Bony infilling</i>
1	Success	Small and neat, no apparent amalgam spillage	Reduced by 4 mm or less	Complete or almost complete
2	Success likely	Larger and/or irregular amalgam; small amalgam spillage	Reduced between 4 and 7 mm	Some bony infilling apparent
3	Failure likely	Large and/or irregular amalgam; significant amalgam spillage	Reduced by more than 7 mm	No bony infilling apparent

Of these criteria root length was considered the most important when grading apicected teeth. Apicected teeth were graded from their postoperative radiographs according to a best fit into the three grades above. This was not designed as a detailed accurate assessment but one that might represent the brief assessment by a clinician in the course of a review appointment

retrograde root fillings were placed. These patients were invited by post to attend for a clinical and radiological assessment of their apicectomy, and to express their own views on the treatment they had undergone. The general dental practitioners of those patients who did not respond were contacted and asked to answer a brief questionnaire which asked if the patient was still attending them, and if so was the apicectomy successful. If the answer was no, they were asked for the date that the tooth was lost or reapicected. The notes of all patients who attended and whose general dental practitioners had answered the questionnaire were examined and the patients categorised according to age; sex; the type of tooth apicected; whether the apicected tooth was symptomatic preoperatively; whether a sinus or swelling was related to the apicected tooth preoperatively; whether the apicectomy was a first or subsequent attempt; whether an orthograde root filling was present; the pathological diagnosis if requested; the type of anaesthesia used; the grade of surgeon carrying out the procedure; whether pre- or postoperative antibiotics were used and their type.

The radiographs of all these patients were also examined and were estimated for success or failure (Table I), without prior knowledge of the outcome. The criteria used for this estimation included the appearance of the retrograde root filling; a neat small amalgam seal was, for example, considered to be superior to a large amalgam seal with spillage in the adjacent tissues; the amount of root remaining; and the degree of bony infilling. Allowance was made for the postoperative time regarding this last factor, since this varied considerably. All these factors were summated to give each apicectomy a radiographic grade. Grade 1 was considered an excellent result and therefore not expected to fail. Grade 2 was considered average, but there appeared to be some chance of failure. Grade 3 was considered a poor result with anticipation of failure of the apicectomy.

Those patients attending were asked to complete a short questionnaire regarding the acceptability of their apicectomy. Any recent symptoms relating to the apicected tooth were noted. The apicected tooth was examined

clinically for the presence of soft tissue swellings, a sinus, tenderness to percussion and mobility. A periapical radiograph was taken.

Results

Of the 147 patients contacted, 40 actually attended for examination and a further 40 were assessed from the general dental practitioners' response and their clinical records. Outcome was identical for both groups at 89% success. All teeth examined were asymptomatic and not tender to percussion. In all, 11 exhibited grade 1 mobility, but none exhibited grade 2 mobility or more. None of the teeth examined were associated with soft tissue swellings or a sinus.

The age distribution of those undergoing the procedure was evenly distributed above the age of 20 years, and with no significant relationship to outcome (Table IIa and Fig. 1). The procedure was carried out more frequently on women, but sex did not influence outcome (Table IIb). Out of 97, 73 (75%) of the teeth apicected were incisors, of which 8 (11%) had failed. Of the other teeth apicected, eight canines, 14 premolars and two molars, only three failed (13%) (Table IIc and Fig. 2). There was a small difference in the failure rate of symptomatic and asymptomatic teeth, though this difference was not significant (χ^2) (Table IId, e). Whether the apicectomy carried out was the first or subsequent attempt made no difference to outcome (Table IIe and Fig. 3). When multiple teeth were apicected at the same procedure six out of 32 failed (19%), representing an increased risk of failure (Table IIg). When an orthograde root filling was present the failure rate was similar, eight failures out of 49 (16%), against four failures out of 46 (9%) (Table IIh). When a specimen was sent for histopathological analysis it was just as likely to be a cyst or a granuloma, 16 cysts and 27 granulomas (Table IIj, i).

An almost equal number of apicectomies were carried out under local and general anaesthesia (55 and 42), with no significant difference in failure rate (χ^2) (Tables IIk, l).

Table II. Results of patient record survey (80 patients, 97 apicectomies, 86 successful, 89% success rate)

		Outcome		Success rate %
		Succeed	Fail	
a. Age of patient	11	1	—	—
	15–20	4	—	—
	20–30	22	2	92
	30–50	29	6	83
	50+	30	3	91
b. Sex of patient	M	31	5	86
	F	55	6	90
c. Type of tooth apicected	Incisor	65	8	89
	Canine	6	2	75
	Premolar	13	1	93
	Molar	2	—	—
d. Tooth asymptomatic at consultation or preop.		52	8	87
Tooth symptomatic at consultation or preop.		34	3	92
e. No sinus or swelling at consultation or preop.		47	8	84
Sinus or swelling at consultation or preop.		39	3	93
f. First or subsequent attempt	First	73	10	88
	Second	11	1	92
	Third	2	—	—
g. Single teeth apicected		54	5	92
Multiple teeth apicected as one procedure		32	6	84
h. Orthograde root filling was*	Present	41	8	84
	Absent	42	3	93
j. Histology	Cyst	16	3	84
	Granuloma	27	2	93
	No histology	43	6	88
k. Carried out under local anaesthesia		49	6	89
l. Carried out under general anaesthesia		37	5	88
m. Grade of surgeon carrying out procedure	Consultant	8	3	73
	Registrar	19	2	90
	SHO	59	6	91
n. Preoperative antibiotics		10	2	80
o. Postoperative antibiotics		63	7	90
p. No antibiotics		13	2	87

* Not all records indicated whether or not an orthograde root filling was present

The outcome was not dependent on the grade of surgeon carrying out the procedure (Tables II m, n and Fig. 4). There was no advantage perceived in administering perioperative antibiotics (Tables II n, o).

It was possible to analyse radiographs relating to 76 apicectomies. There was little correlation when the overall impression of the radiological appearance of the

apicectomy was recorded and then compared with outcome (Fig. 5). In the 11 cases where failure did occur, the time of failure ranged from 1 month to 61 months, median 14.5 months (Table III).

All but two of the 40 patients who responded to our questionnaire thought that any discomfort involved in the procedure was justified, and all but three thought that the

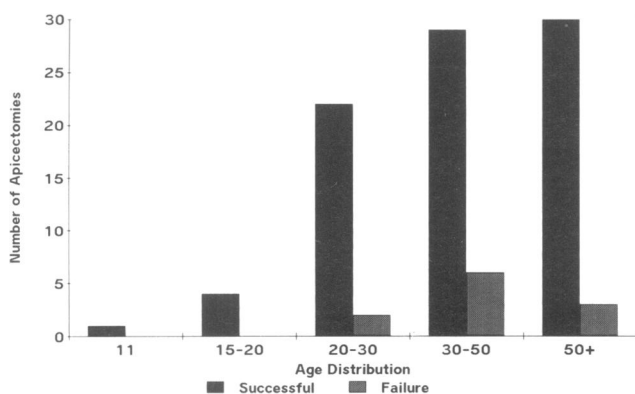


Figure 1. Age distribution and outcome of apicectomy.

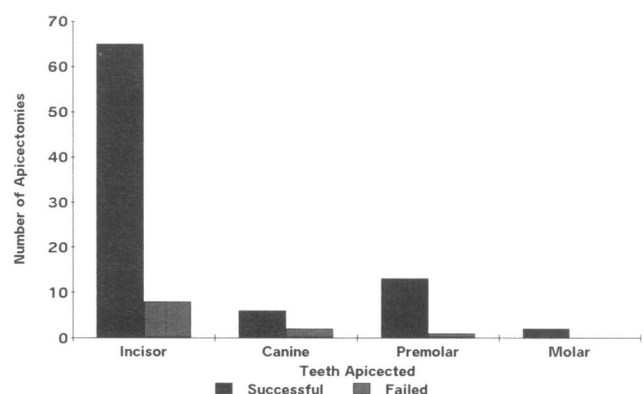


Figure 2. Type of tooth apicected and outcome.

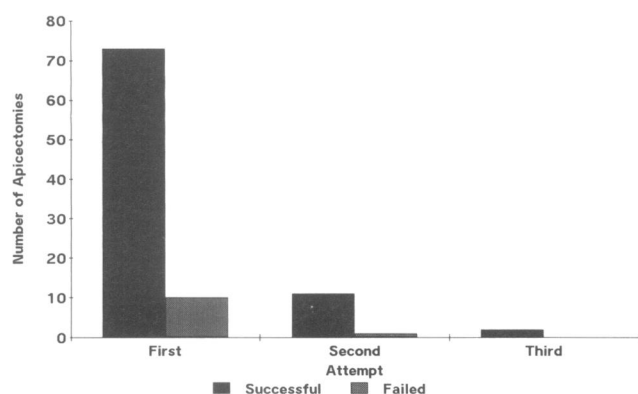


Figure 3. Attempt number and outcome.

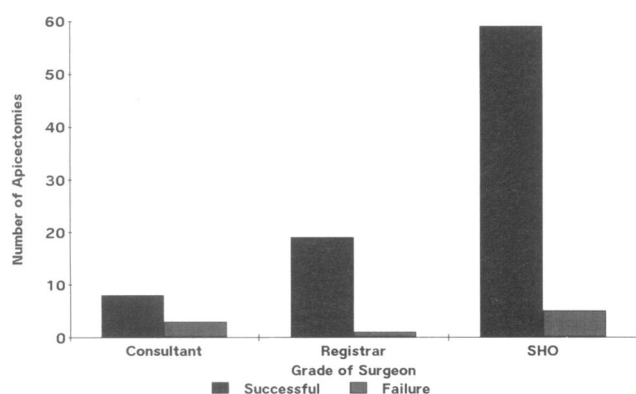


Figure 4. Grade of surgeon and outcome.

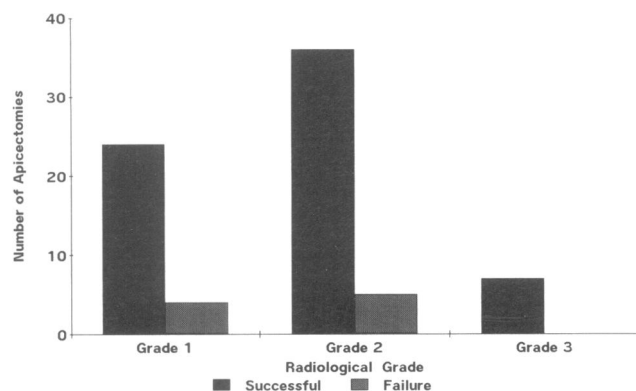


Figure 5. Radiographic estimation of outcome.

time they had spent in preoperative consultation, the procedure itself and follow-up appointments, was worthwhile (Table IV).

Discussion

Although the number of cases involved in this audit make it difficult to draw too many conclusions, certain inferences could be made that would affect the practice in this unit. A success rate of 89% for apicectomy would seem to be justification for carrying out this procedure in a district general hospital. It was interesting that outcome was identical in the group of patients who actually

Table III. Failures

Time of failure	Last asymptomatic review appointment (months)
1 months	
2 months	
6 months	2
9 months	3
8 months	5
2 years	6
4 years	2
4 years	8
4 years	9
5 years	7
5 years	10
5 years	11

Table IV. Patients' perceptions of treatment

Question	Response	
	Yes	No
Do you think any discomfort that you had justified the attempt to save the tooth?	38 (95%)	2 (5%)
Do you think that the time you spent for the initial consultation, operation and subsequent follow-up consultation was worthwhile?	37 (93%)	3 (7%)

attended for review, and in the group who were assessed with the help of their general dental practitioners and clinical records. This indicated that our data were probably not affected by those with a successful outcome replying preferentially.

It seems that all grades of surgeon can carry out this procedure effectively. Although the numbers were small, reapiectomy did not apparently carry a worse prognosis than first attempts. This implies that teeth where apicectomies have failed should be reapiected rather than extracted. This is particularly relevant to hospital practice since a significant proportion of endodontic referrals may be prompted by the failure of previous apicectomies. Moreover, multirooted teeth did not seem to carry a worse prognosis. It was interesting that the presence of an orthograde root filling did not improve outcome and indeed seemed to worsen it. This might be explained by the fact that in teeth where periapical sepsis is refractory to orthograde treatment, it may also be refractory to retrograde treatment. There is certainly no evidence in these figures that the presence of an orthograde root filling improves outcome.

Preoperative factors including the presence of pain, swelling or a discharging sinus did not affect prognosis in accordance with other studies involving larger case numbers (1). The histology of the periapical lesion seemed also not to affect prognosis in accord with the results of a previous study (3).

The use of perioperative antibiotics seemed to have no bearing on the 5-year outcome, and examination of the case records, showed few cases of infection in the immediate postoperative period. In view of this, there seems little to justify the routine use of perioperative antibiotics, though this assertion can only be verified by a randomised controlled trial.

From the data it seems that postoperative radiography is unhelpful. Many apicected teeth with little or no apparent bony healing at 6–8 months were still present and asymptomatic 5 years postoperatively. This was also the conclusion of a study conducted on 330 orthograde endodontic cases (4). In other studies, residual radiolucent areas have been found to be common and result from irreversible damage, by infection or surgical resection of either the outer or inner cortical plate or both alveolar plates (5).

In concordance with other studies involving larger case numbers, the time period at which apicectomies failed was extremely variable and most failures did not occur in the follow-up time or within the first postoperative year. This fact, coupled with the unreliability of radiographs as an indicator of outcome, brings into question the value of oral surgery departments following up their apicectomies for months after the procedure, as is commonplace.

Nearly all the patients surveyed including some whose apicectomies failed thought the time involved in undergoing the procedure and any resultant discomfort was worthwhile.

Apicectomy is a procedure that may be carried out in this district general hospital by staff of all grades, with a

high probability of success. It seems very acceptable to the 40 patients who replied. Previously, apicected teeth or molar teeth did not seem to confer a worse prognosis, although the numbers used in this study are insufficient to confirm this. Postoperative radiography was not justified, and repeated follow-up appointments seemed unhelpful.

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